UAV Mission Trainer

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Programs Manager

Report Documentation Page

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Presentation Contents

- Silver Arrow company overview
- Mission trainer highlights and overview
- System configuration and features

Silver Arrow

A Subsidiary of Elbit Systems Ltd

Background

- Established 1985
- In-house UAV experience of 17 years, based on IDF operational experience of 27 years
- Prime supplier of tactical new generation UAV systems to the IDF

Building Blocks

Mini - V

HERMES 180

HERMES 450

HERMES 1500

Engines

ILS

Trainer

Communication

Control Station

Payloads

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HERMES 180

- General data:
  - Gross weight 180Kg
  - Wing span 6m
  - Ceiling 15Kft
  - Endurance 10 hrs
  - Payload 32Kg
  - Power supply 1.2Kw
- Catapult launch, parachute/airbag recovery
- Day + night + laser designator payloads

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HERMES 450
HERMES 450
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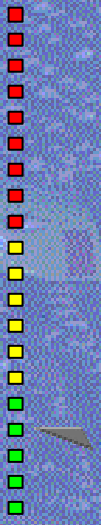
HERMES 450

- General data:
  - Gross weight 450Kg
  - Wing span 10.5m
  - Ceiling 18 Kft
  - Endurance 20 hrs
  - Payload 150 Kg
  - Power supply 2.2Kw
- Real-time day & night imagery SAR
- Other



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HERMES 1500

- General data:
  - Gross weight 1500Kg
  - Wing span 15m
  - Ceiling 30Kft
  - Endurance 25 hrs
  - Payload 350Kg
  - Power supply 9.8Kw
- Day & night imagery + SAR
- Maritime patrol & other

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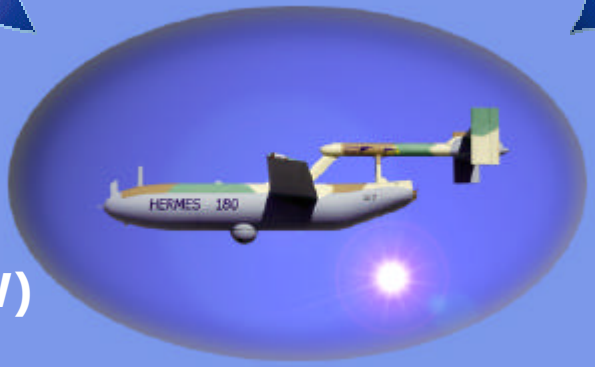
Technologies & Expertise

Composite Structure

System Engineering

System integration & Testing



Avionics (H/W, S/W)

Rotary Engines

Command & Control

Electro Optics

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The Need For UAV Trainer

- Reducing the number of actual sorties
- Disregarding the actual weather conditions and technical availability
- Many airborne and ground subsystems to operate and control
- Training in emergency and malfunction situations
- Capability of mission rehearsal

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Visual Simulation

"Everything is possible.
The impossible just
takes a bit longer..."

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The UAV Trainer Goal

To enable the GCS operators to train mission planning and execution in their own natural operational environment

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Trainer Highlights

- 3D terrain DB with resolution of up to 25 cm/pixel
- Day (CCD camera) and night (FLIR) sensor simulation.
  Including noise, jitter, and variations in sensor responsiveness

- Realistic frame rate generation

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Trainer Highlights

- Continuous zoom and video rotating and tilting
- 3D ground tracking vehicles (stationary and mobile)

- DIS compliant

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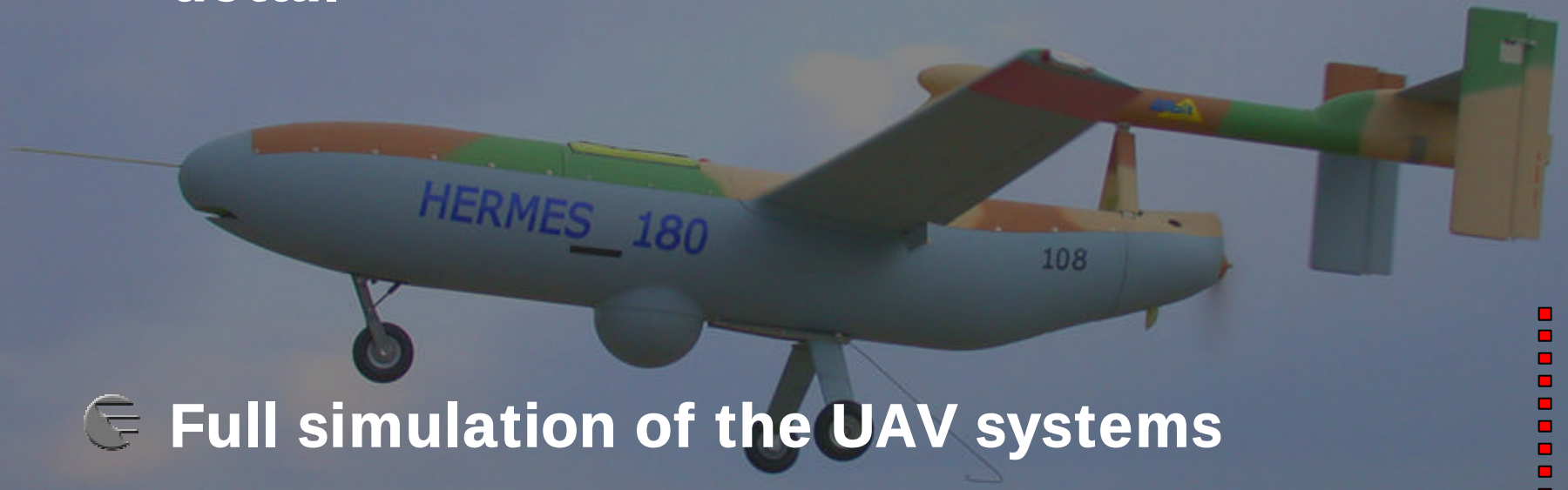
Trainer Highlights

- The UAV flight model (6DoF) is simulated in detail



- Full simulation of the UAV systems
- The electro-optical tracking system is simulated

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Trainer Highlights

- Dedicated scenario generator

- Ability to train both in normal operating environment and in malfunction / emergency situations

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Trainer Highlights

- Covering the full range of mission phases:
  - Mission planning
  - cruising
  - reconnaissance
  - surveillance tasks: artillery adjustment, damage assessment and more.

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Trainer Highlights

- Training in the actual operators' environment - standard GCS environment.

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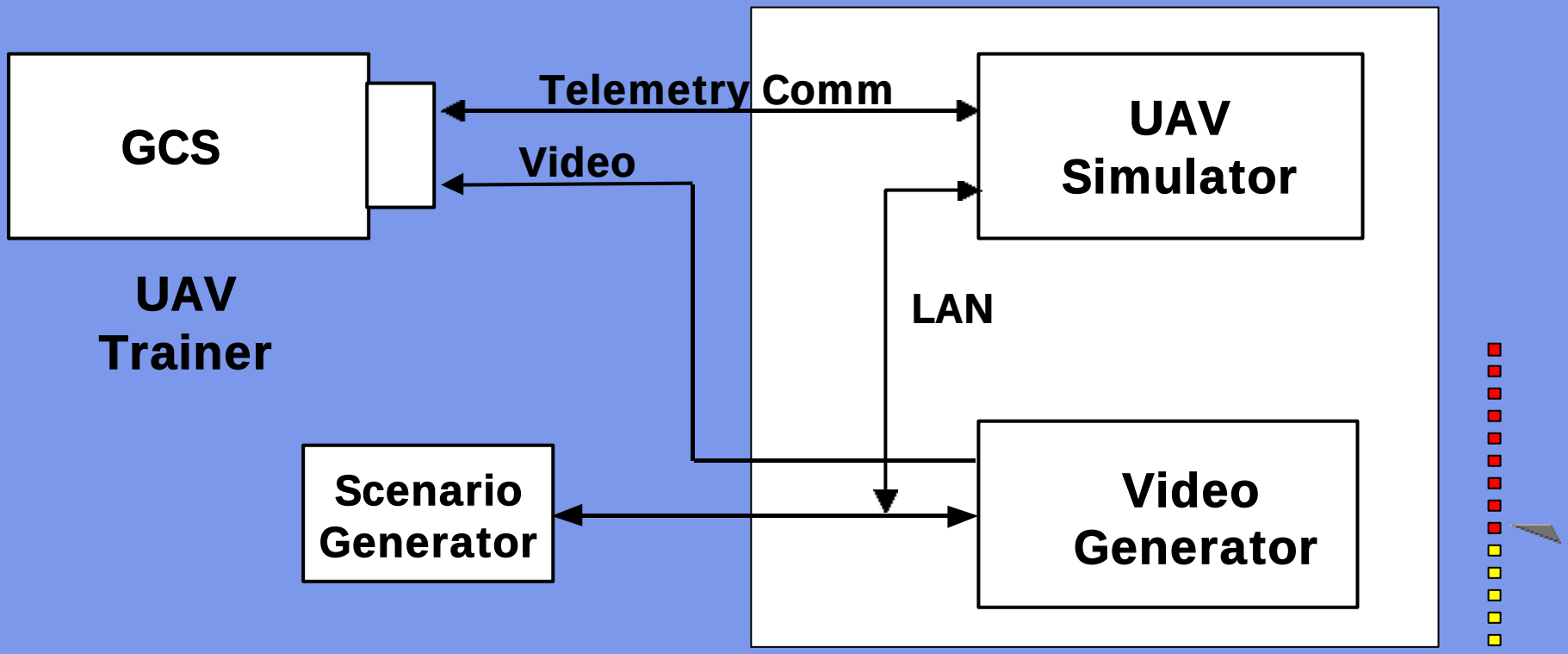
Weather and Battlefield Effects

- Fog/Haze with control over the visibility
- Clouds - various kinds of 3D, radiometric correct clouds with control over their location, altitude and density
- Ground shadows for the ground objects

Weather and Battlefield Effects

- Smoke and dust with accurate display both in visible light and thermal view,swaying according to the wind
- Various kinds of explosions and fire with accurate display both in visible light and thermal view

General Configuration



UAV and UAV Systems Simulator

The UAV and UAV systems simulator is a real time simulator which simulates:

- UAV flight (6 DOF)
- Payload operation (except the video)
- UAV communication
- UAV systems

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High-Resolution Visual Video Generator

The High-Resolution Visual Video generator generates “real” video of the outside world including:

- Terrain
- Ground vehicles (both stationary and moving)
- Weather affects such as clouds and haze conditions
- Special effects such as explosions, smoke and dust

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High-Resolution Visual Video Generator

Realistic 3D Video:

– Smooth movement across the terrain

– Smooth zoom (change of FOV)

– Rotation and tilt according to the UAV and payload maneuver

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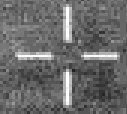
High-Resolution Visual Video Generator



The High-Resolution Video Generator produces both regular daylight visual output and day/night FLIR output.

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Video Examples

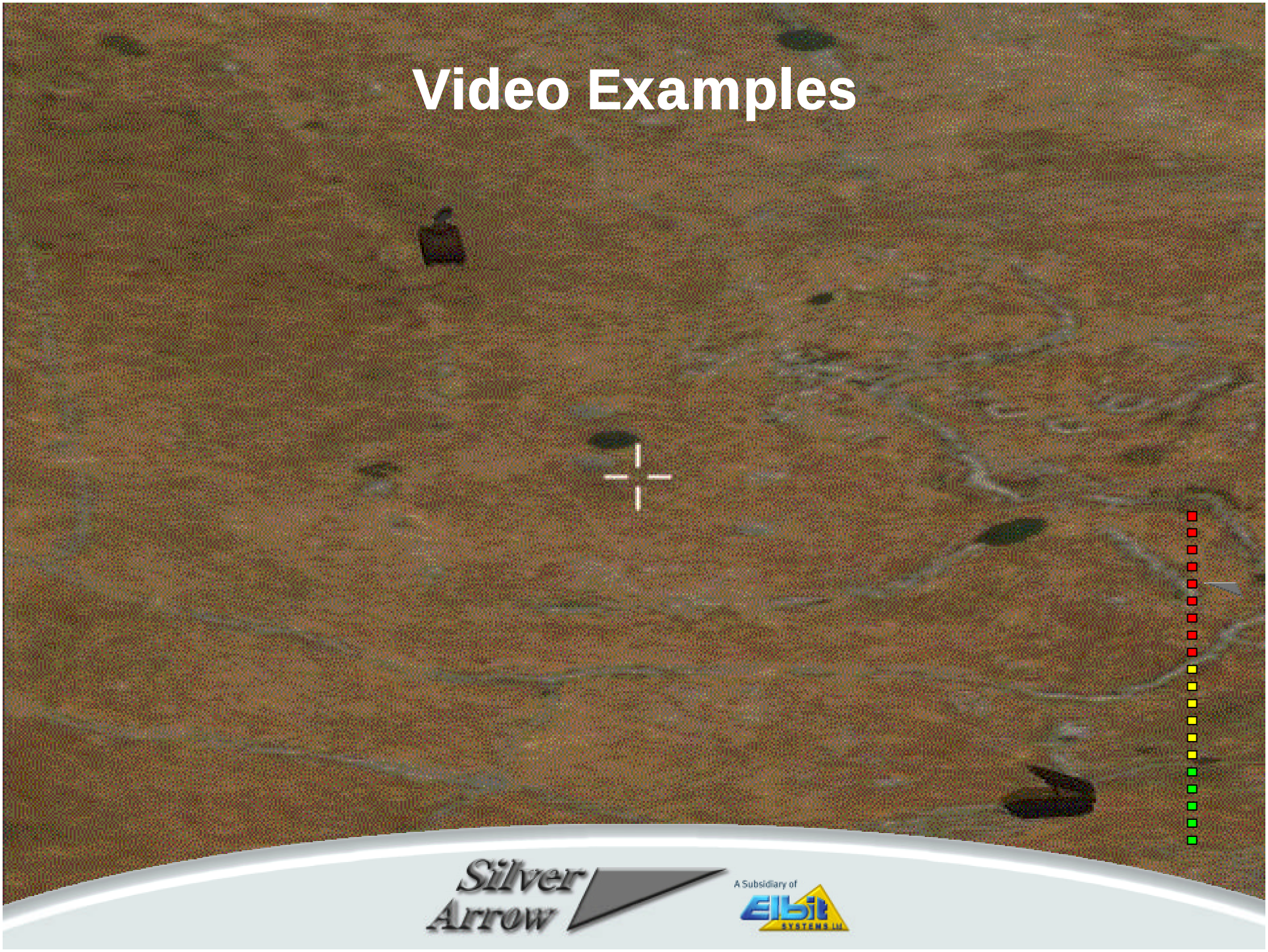
Video Examples

Video Examples

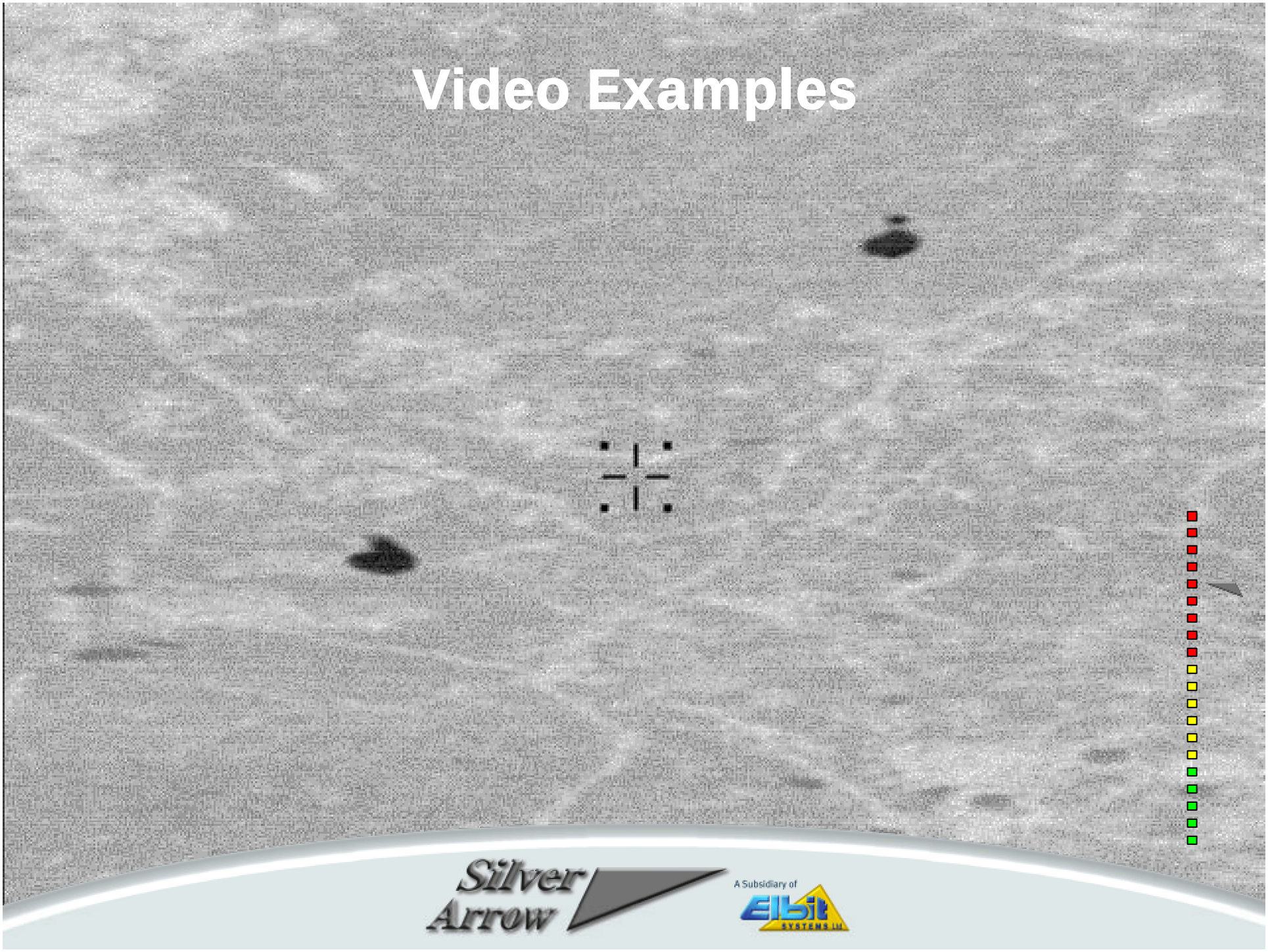
Video Examples

Video Examples

Video Examples



Video Examples



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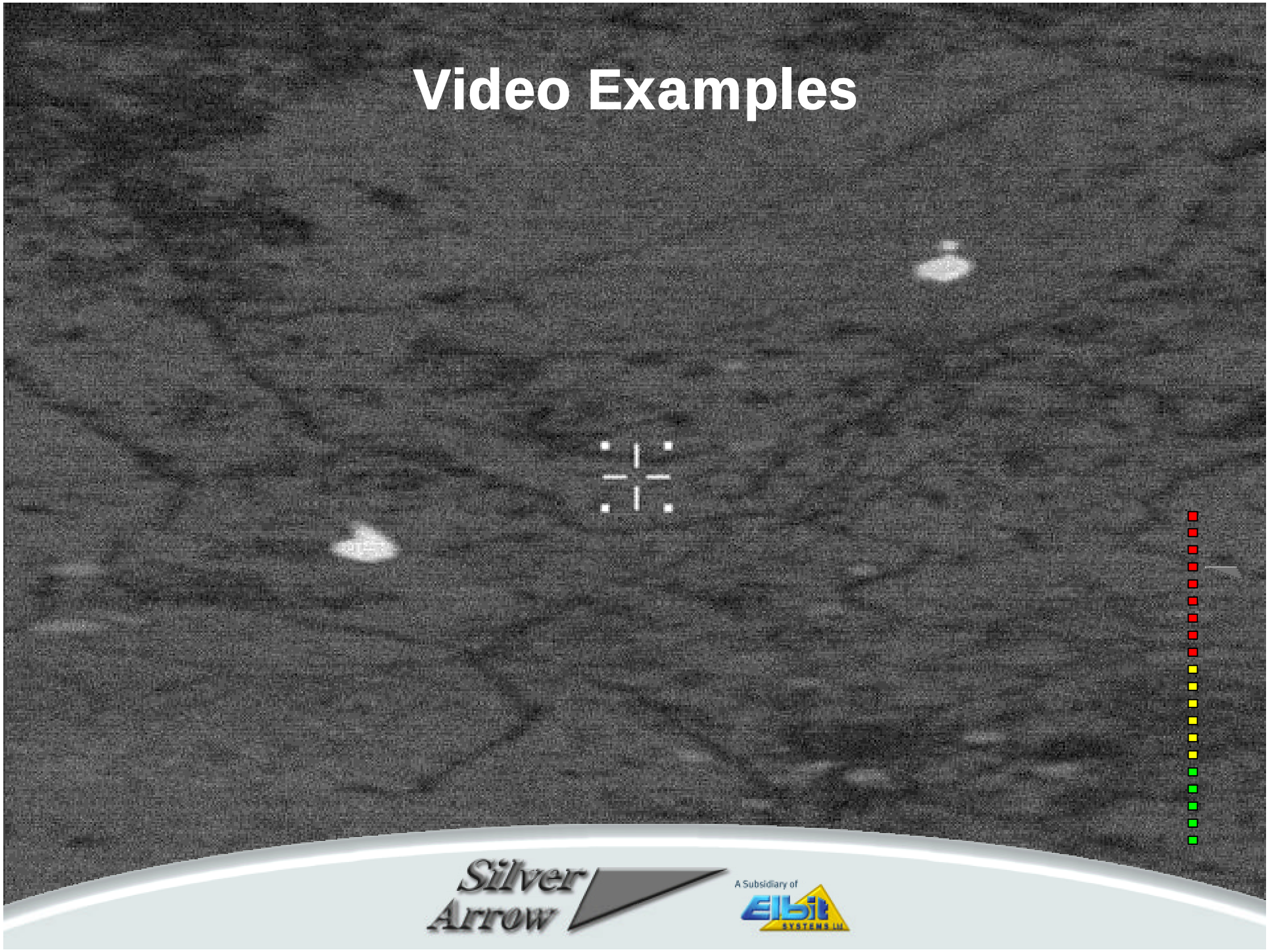
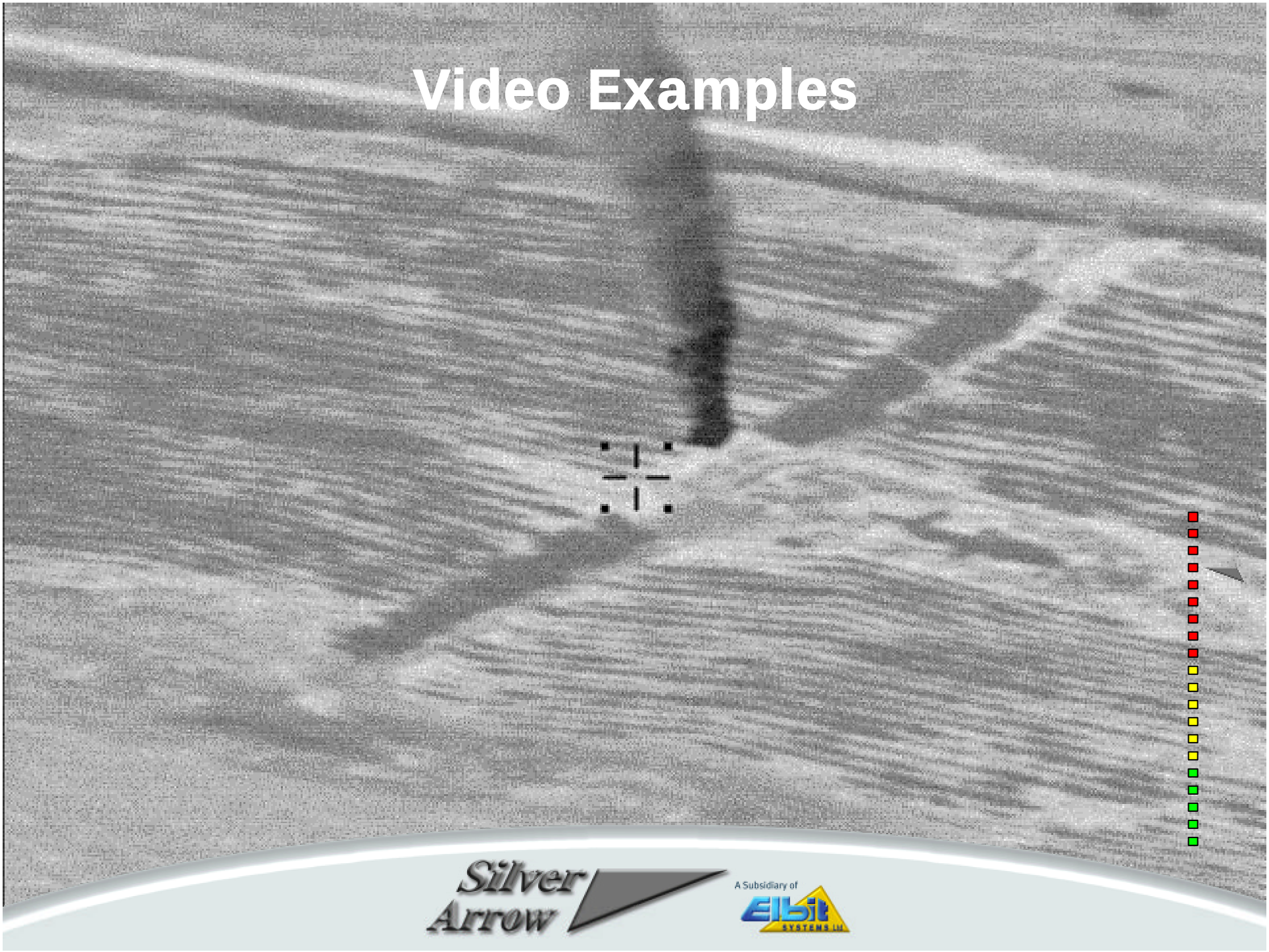
Video Examples



Video Examples

Video Examples



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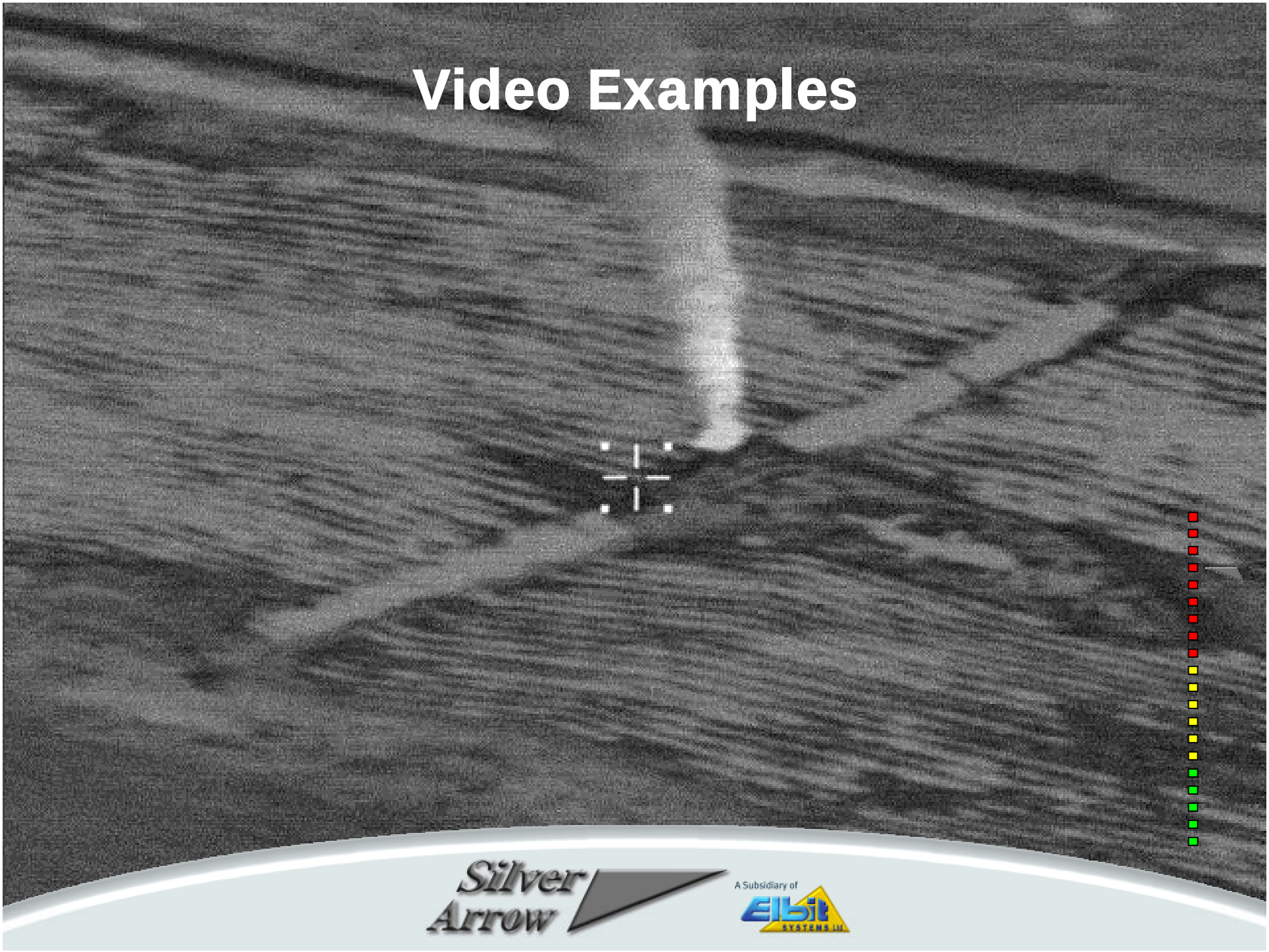
Video Examples



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Scenario Generator

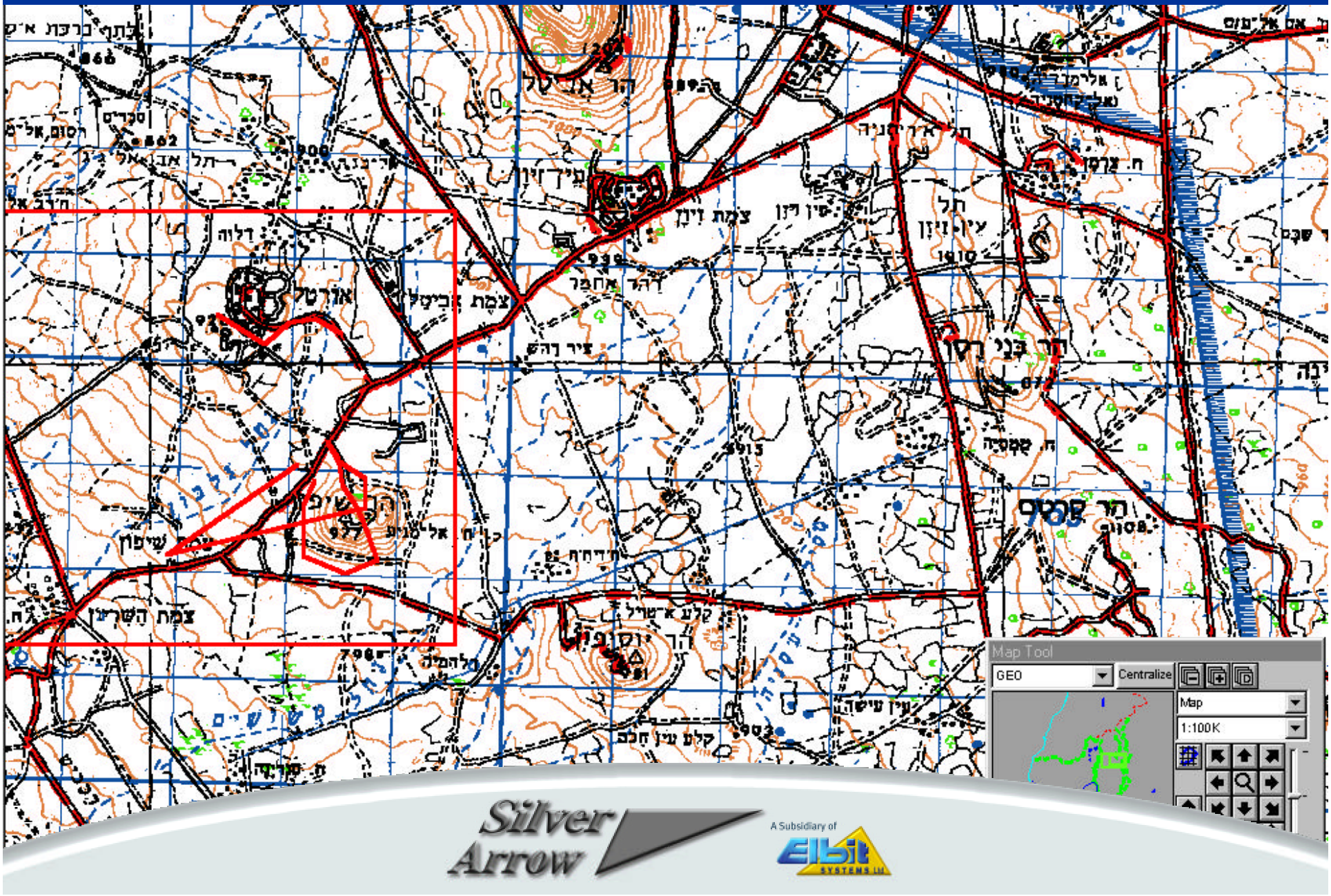
- The scenario generator is implemented in the instructor station. It is used during the preparation and running stages of the exercise
- The scenario generator is used to create, update, and control the training scenarios
- A scenario includes the terrain, ground vehicles, weather conditions, training parameters, events and malfunctions

Scenario Generator

The control functions allow the instructor to:

- Start / stop the exercise
- Jump forward and backwards in time
- Inject events such as faults and weather changes in real-time
  (overriding the events in the scenario)

Scenario Generator View



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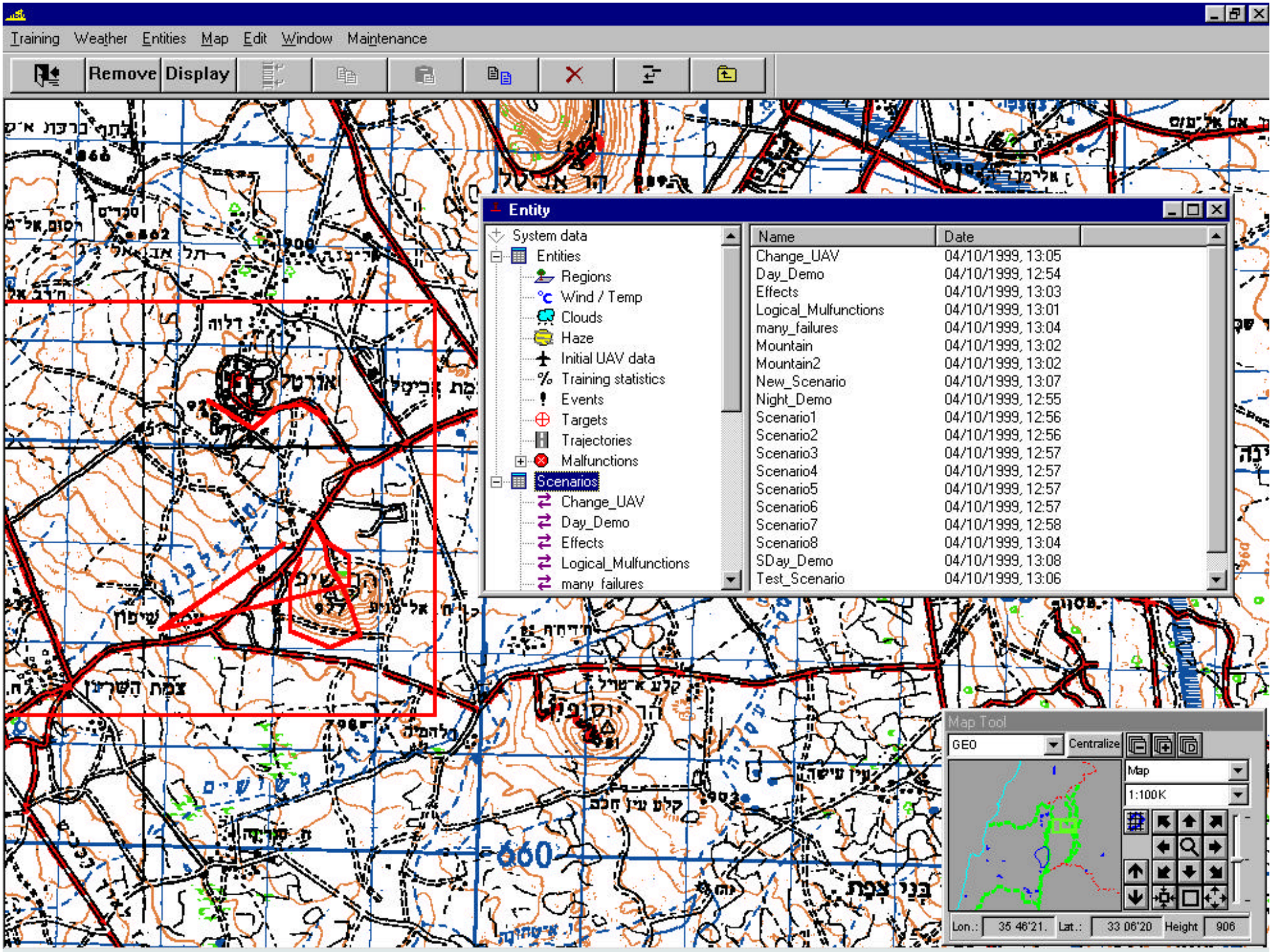
Training
Weather
Entities
Map
Edit
Window
Maintenance
Remove
Display
Entity
System data
Entities
Regions
Wind / Temp
Clouds
Haze
Initial UAV data
Training statistics
Events
Targets
Trajectories
Malfunctions
Scenarios
Change_UAV
Day_Demo
Effects
Logical_Mulfunctions
many_failures
Name
Date
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Day_Demo 04/10/1999, 12:54
Effects 04/10/1999, 13:03
Logical_Mulfunctions 04/10/1999, 13:01
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Mountain 04/10/1999, 13:02
Mountain2 04/10/1999, 13:02
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Scenario1 04/10/1999, 12:56
Scenario2 04/10/1999, 12:56
Scenario3 04/10/1999, 12:57
Scenario4 04/10/1999, 12:57
Scenario5 04/10/1999, 12:57
Scenario6 04/10/1999, 12:57
Scenario7 04/10/1999, 12:58
Scenario8 04/10/1999, 13:04
SDay_Demo 04/10/1999, 13:08
Test_Scenario 04/10/1999, 13:06
Map Tool
GEO
Centralize
Map
1:100K
Lon.: 35 46'21.
Lat.: 33 06'20
Height 906

Joint Distributed Training

- The tactical UAV mission trainer is DIS compliant (simulation comm. protocol)
- Create joint distributed training environments. Different units can train and interact on the same scenario at the same time.
- Joint and cross platforms/systems/units operations training (intelligence forces, artillery units, air support squadrons etc.)

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UAV Trainer Configurations

- The Trainer has four basic configurations:
  - Embedded Trainer
  - Low-End, Low-Cost deployable / stationary trainer, based on NT graphic platform
  - High-End graphics, deployable / stationary trainer, based on SGI's ONYX 2 machine.
  - Training center.

Video Example

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